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(54) **POLAROID, TOUCH-CONTROL LIQUID CRYSTAL PANEL AND TOUCH-CONTROL LIQUID CRYSTAL DISPLAY MODULE**

(57) The present disclosure provides a polarizer. The polarizer includes: a substrate provided with a first surface and a second surface that are opposite to each other; and a first triacetyl cellulose (TAC) film, a polyvinyl acetate (PVA) film and a second TAC film that are provided on the first surface of the substrate, where at least one of the first surface and the second surface of the

substrate is further provided with a transparent conductive layer, which forms a touch electrode. The present disclosure further provides a touch-sensitive liquid crystal display (LCD) panel and module using the polarizer. The polarizer provided by the present disclosure can reduce the thicknesses of the touch-sensitive LCD panel and module, and simplify their production processes.

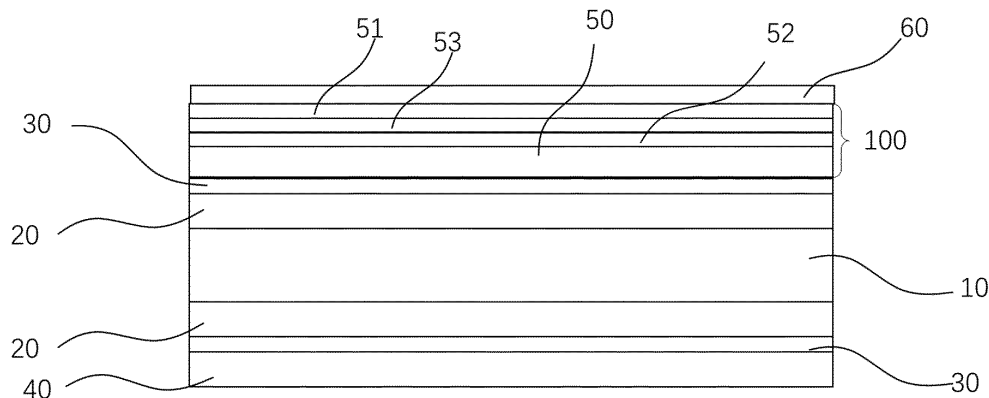


FIG. 4

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of display, and in particular to a polarizer, and a touch-sensitive liquid crystal display (LCD) panel and module.

BACKGROUND

[0002] With the development of technology, touch-sensitive display devices are becoming increasingly popular. At present, capacitive touch screens are mainly available in the market. In the field of LCD, touch modules are generally fabricated in forms of on-cell and in-cell, among which in-cell is dominant. A glass-film-film (GFF) structure is typically used in the touch module. The touch sensing function of the touch screen is realized by the overall bonding of two optically clear adhesives (OCAs) and two patterned conductive film materials, which results in an increase in the product thickness. In addition, the GFF structure is typically manufactured by another touch screen factory, which leads to an increase in the product cost.

SUMMARY

[0003] The present disclosure provides a polarizer that can integrate a touch module so as to reduce an overall product thickness and simplify a production process.

[0004] The polarizer provided by the present disclosure includes: a substrate provided with a first surface and a second surface that are opposite to each other; and a first triacetyl cellulose (TAC) film, a polyvinyl acetate (PVA) film and a second TAC film that are provided on the first surface of the substrate, where at least one of the first surface and the second surface of the substrate is further provided with a transparent conductive layer, which forms a touch electrode.

[0005] The first surface and the second surface of the substrate may be respectively provided with transparent conductive layers, which may form a first touch electrode and a second touch electrode, respectively.

[0006] Preferably, one of the first surface and the second surface of the substrate may be sequentially provided with a first transparent conductive layer, an insulating layer and a second transparent conductive layer; one of the first transparent conductive layer and the second transparent conductive layer may form a first touch electrode and a second touch electrode, and the other of the first transparent conductive layer and the second transparent conductive layer may form a bridge; and one of the first touch electrode and the second touch electrode may be connected by the bridge.

[0007] Preferably, the transparent conductive layer may be an indium tin oxide (ITO) conductive layer, an indium zinc oxide (IZO) conductive layer, a nano-silver wire conductive layer or a metal mesh conductive layer.

[0008] The present disclosure further provides a touch-sensitive LCD panel, including an array substrate, a liquid crystal layer, an electrode layer, a filter and the aforementioned polarizer.

[0009] The present disclosure further provides a touch-sensitive LCD module, including a backlight module and the aforementioned touch-sensitive LCD panel.

[0010] The polarizer provided by the present disclosure can reduce the thicknesses of the touch-sensitive LCD panel and module, and simplify their production processes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a structural diagram of a polarizer according to an embodiment of the present disclosure;

FIG. 2 is a structural diagram of a touch electrode formed by a transparent conductive layer shown in FIG. 1;

FIG. 3 is a structural diagram of a touch module, shown in FIG. 2, from another angle; and

FIG. 4 is a structural diagram of a polarizer according to another embodiment of the present disclosure;

FIG. 5 is a structural diagram of touch electrodes formed by a first transparent conductive layer and a second transparent conductive layer shown in FIG. 4;

FIG. 6 is a sectional view taken along A-A in FIG. 5; and

FIG. 7 is a sectional view of a touch electrode according to another embodiment of the present disclosure.

Reference Numerals:

[0012] 10. PVA film; 20. TAC film; 30. pressure-sensitive adhesive; 40. release film; 50. substrate; 51/52. transparent conductive layer; 53. insulating layer; 60. protective layer; 100. touch module; TX1/TX2. first touch electrode; RX1/RX2. second touch electrode; and BR. bridge.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0013] The foregoing and other technical contents, features and effects of the present disclosure will be clearly presented in the following detailed description of preferred embodiments in conjunction with the drawings. The directional terms mentioned in the following embodiments, such as top, bottom, left, right, front and rear, are only used to indicate the directions shown in the drawings. Therefore, the directional terms used herein are intended to illustrate rather than limit the present disclosure. The present disclosure will be further described in detail below with reference to the drawings.

[0014] FIG. 1 is a structural diagram of a polarizer ac-

cording to an embodiment of the present disclosure. As shown in FIG. 1, in this embodiment, the polarizer includes a substrate 50, a PVA film 10 and TAC films 20 provided on two sides of the PVA film 10. For convenience of description, the TAC film 20 close to the substrate 50 is denoted as a first TAC film, and the TAC film 20 away from the substrate 50 is denoted as a second TAC film. A pressure-sensitive adhesive 30 may further be provided between the substrate 50 and the first TAC film. A release film 40 is further provided on a side of the second TAC film away from the substrate 50. A pressure-sensitive adhesive 30 is provided between the release film 40 and the second TAC film. In the present disclosure, the polarizer integrates a touch module 100. A first transparent conductive layer 51 and a second transparent conductive layer of the touch module 100 are respectively provided on two opposite surfaces of the substrate 50. For convenience of description, the surface of the substrate 50 facing the TAC film 20 is denoted as a first surface, and the surface of the substrate 50 away from the TAC film 20 is denoted as a second surface. The first transparent conductive layer 51 is provided on the first surface, and the second transparent conductive layer 52 is provided on the second surface.

[0015] FIGS. 2 and 3 are structural diagrams of the touch module from different angles according to the embodiment of the present disclosure. The touch module 100 includes the substrate 50, the first transparent conductive layer 51 and the second transparent conductive layer 52. The first transparent conductive layer 51 and the second transparent conductive layer 52 respectively form first touch electrodes TX and second touch electrodes RX. In this embodiment, multiple strip-shaped touch electrodes are provided. However, this is only exemplary, and does not limit the scope of protection of the present disclosure. In other embodiments, the touch electrodes may be rhombic or square, etc.

[0016] FIG. 4 is a structural diagram of a polarizer according to another embodiment of the present disclosure. In this embodiment, the structure of the polarizer is similar to that of the polarizer in the embodiment of FIG. 1. The difference is that, in this embodiment, the first transparent conductive layer 51 and the second transparent conductive layer 52 of the touch module 100 are provided on the second surface of the substrate 50. Specifically, the second surface of the substrate 50 is sequentially provided with the second transparent conductive layer 52, an insulating layer 53, the first transparent conductive layer 51 and a protective layer 60.

[0017] FIGS. 5 and 6 are structural diagrams of the touch module 100 of the polarizer, shown in FIG. 4, according to the embodiment of the present disclosure. FIG. 6 is a sectional view taken along A-A in FIG. 5. As shown in FIG. 5, in this embodiment, the touch electrodes formed by the transparent conductive layer of the touch module 100 are rhombic electrodes. In this embodiment, the rhombic electrodes are formed by the second transparent conductive layer 52, and the first transparent elec-

trode 51 forms bridges BR. The touch electrodes include multiple rows of electrodes Tx and multiple columns of electrodes Rx. In each row of electrodes, the rhombic electrodes are connected to each other. In each column of electrodes, the rhombic electrodes are connected by the bridges BR. The insulating layer 53 is provided at a connection between the bridges BR and the row electrodes. FIG. 6 shows a bridge connection method. The insulating layer 53 isolates the bridges BR from the row electrodes Tx.

[0018] As shown in FIG. 7, in another embodiment of the present disclosure, the rhombic electrodes are formed by the first transparent conductive layer 51, and the second transparent electrode 52 forms the bridges BR. The insulating layer 53 isolates the bridges BR from the row electrodes Tx.

[0019] When the polarizer of the present disclosure is used in a touch-sensitive LCD panel and module, the touch sensing function is realized by a polyethylene terephthalate (PET) film on the polarizer, which effectively reduces the thickness of the traditional product with a GFF structure. In addition, the touch sensing function is directly realized in the production process of the polarizer, which effectively reduces the production cost of the touch-sensitive LCD panel and module and improves the production efficiency thereof.

[0020] The above are only the preferred Embodiments of the present disclosure, and thus the scope of the present disclosure is not limited thereto. Equivalent changes and modifications made in accordance with the claims and specification of the present disclosure should fall within the patent scope of the present disclosure. In addition, it is not necessary for any embodiment or claim of the present disclosure to achieve all of the objectives or advantages or features of the present disclosure. The abstract and title are only used to aid in the retrieval of the patent document and are not intended to limit the scope of the claims of the present disclosure. In addition, terms such as "first" and "second" mentioned in this specification or the claims are only used to name the elements or to distinguish different embodiments or ranges, rather than to limit the upper or lower limit of the number of elements.

Claims

1. A polarizer, comprising: a substrate provided with a first surface and a second surface that are opposite to each other, and a first triacetyl cellulose (TAC) film, a polyvinyl acetate (PVA) film and a second TAC film that are provided on the first surface of the substrate, **characterized in that** at least one of the first surface and the second surface of the substrate is further provided with a transparent conductive layer to form a touch electrode.
2. The polarizer according to claim 1, **characterized**

in that the first surface and the second surface of the substrate are respectively provided with transparent conductive layers to form a first touch electrode and a second touch electrode, respectively.

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3. The polarizer according to claim 1, **characterized in that** one of the first surface and the second surface of the substrate is sequentially provided with a first transparent conductive layer, an insulating layer and a second transparent conductive layer. 10
4. The polarizer according to claim 3, **characterized in that** one of the first transparent conductive layer and the second transparent conductive layer forms a first touch electrode and a second touch electrode, and the other of the first transparent conductive layer and the second transparent conductive layer forms a bridge. 15
5. The polarizer according to claim 4, **characterized in that** one of the first touch electrode and the second touch electrode is connected by the bridge. 20
6. The polarizer according to claim 1, **characterized in that** the polarizer further comprises a protective layer, and the protective layer is provided on a side of the substrate away from the PVA film and on an outermost surface of the polarizer. 25
7. The polarizer according to any one of claims 1 to 6, **characterized in that** the transparent conductive layer is an indium tin oxide (ITO) conductive layer, an indium zinc oxide (IZO) conductive layer, a nano-silver wire conductive layer or a metal mesh conductive layer. 30
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8. A touch-sensitive liquid crystal display (LCD) panel, sequentially comprising an array substrate, a liquid crystal layer, an electrode layer, a filter and a polarizer, **characterized in that** the polarizer is the polarizer of any one of claims 1 to 6. 40
9. The touch-sensitive LCD panel according to claim 8, **characterized in that** the transparent conductive layer is an ITO conductive layer, an IZO conductive layer, a nano-silver wire conductive layer or a metal mesh conductive layer. 45
10. A touch-sensitive LCD module, comprising a back-light module and the touch-sensitive LCD panel according to claim 8. 50

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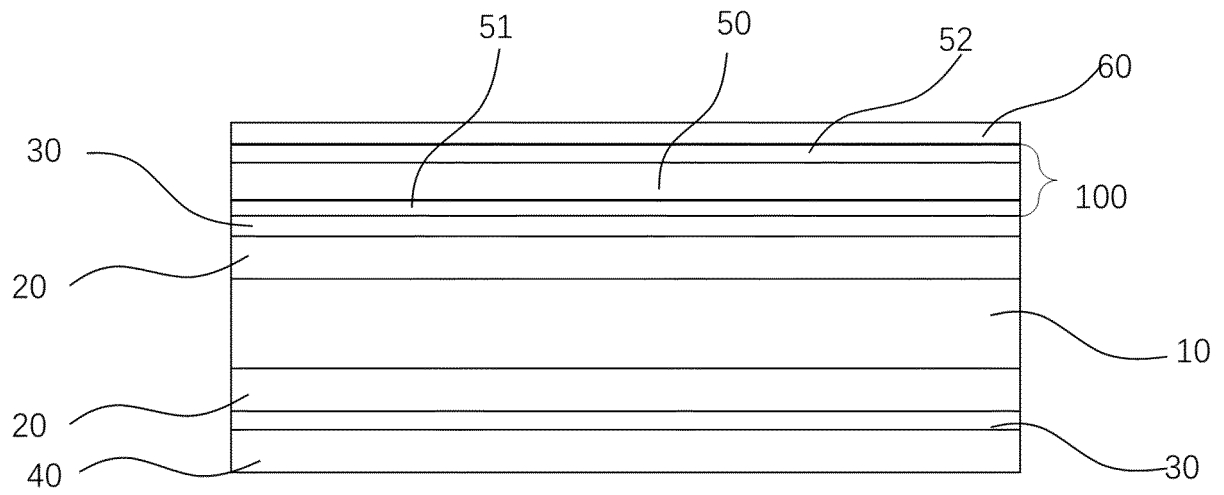


FIG. 1

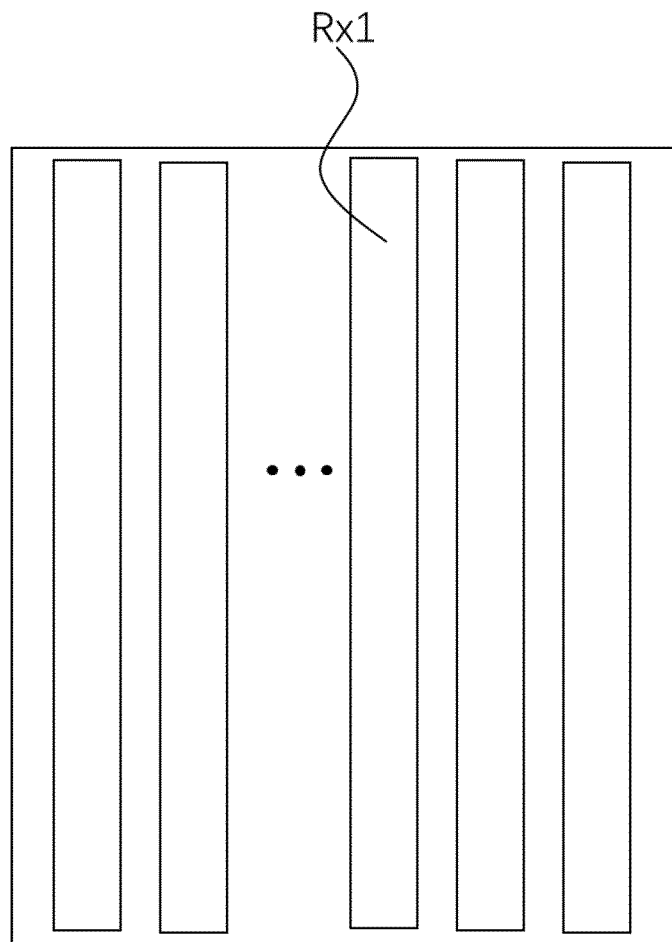


FIG. 2

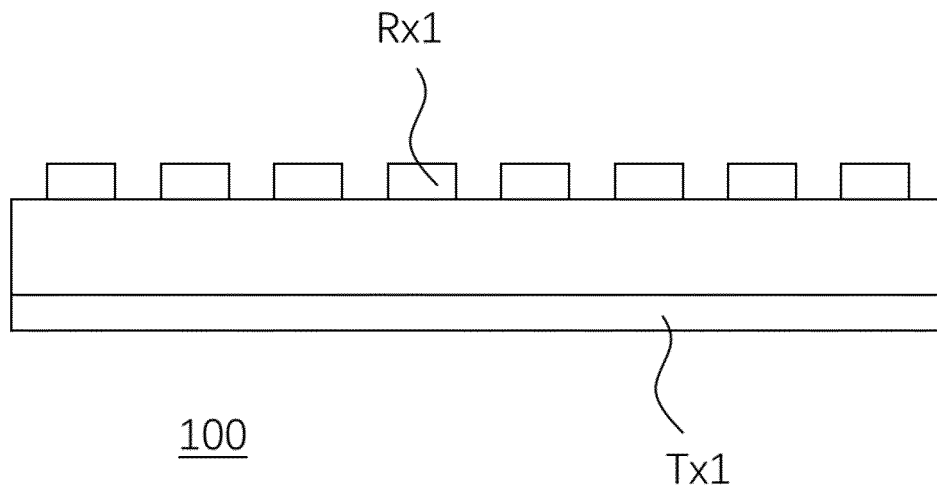


FIG. 3

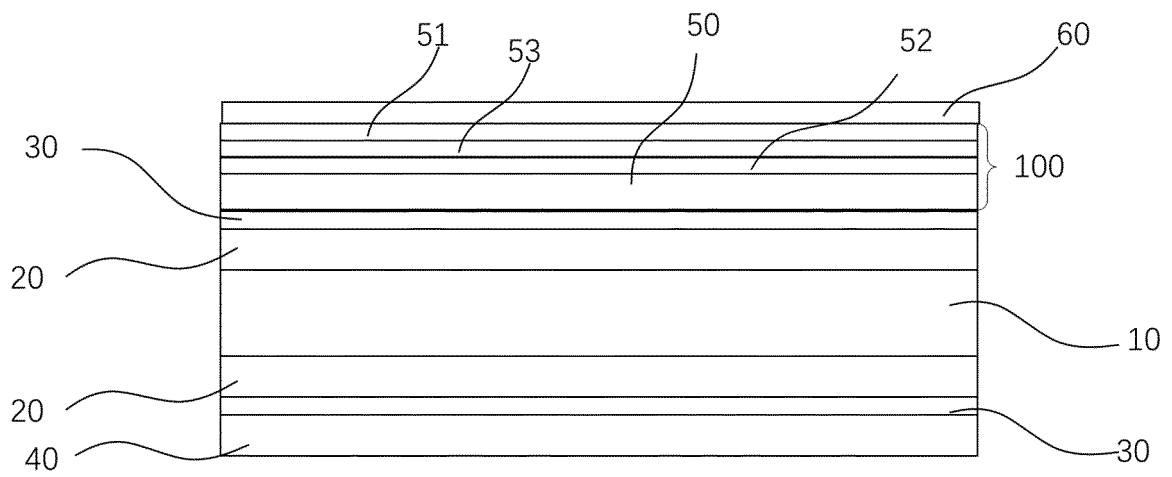


FIG. 4

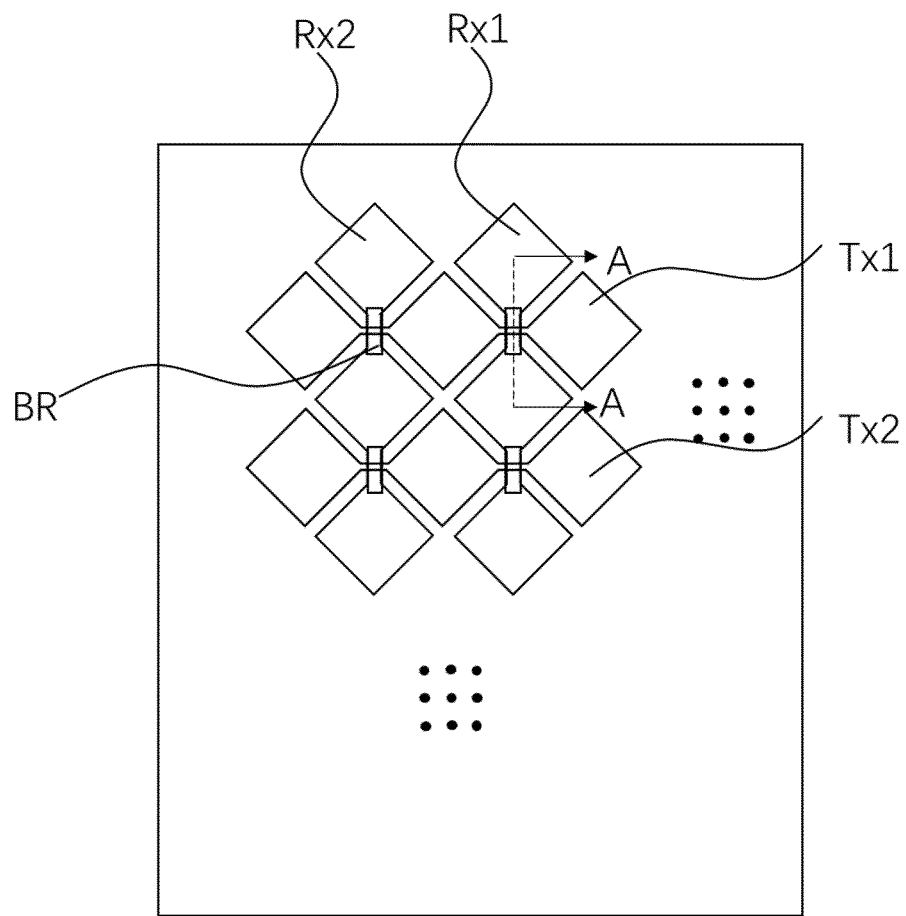


FIG. 5

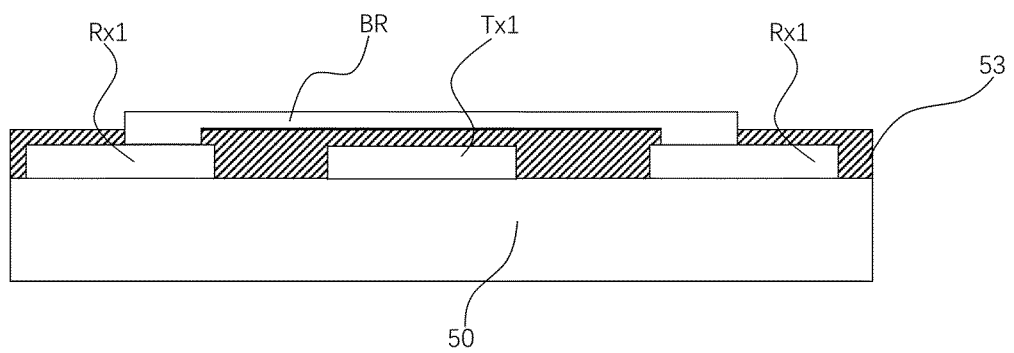


FIG. 6

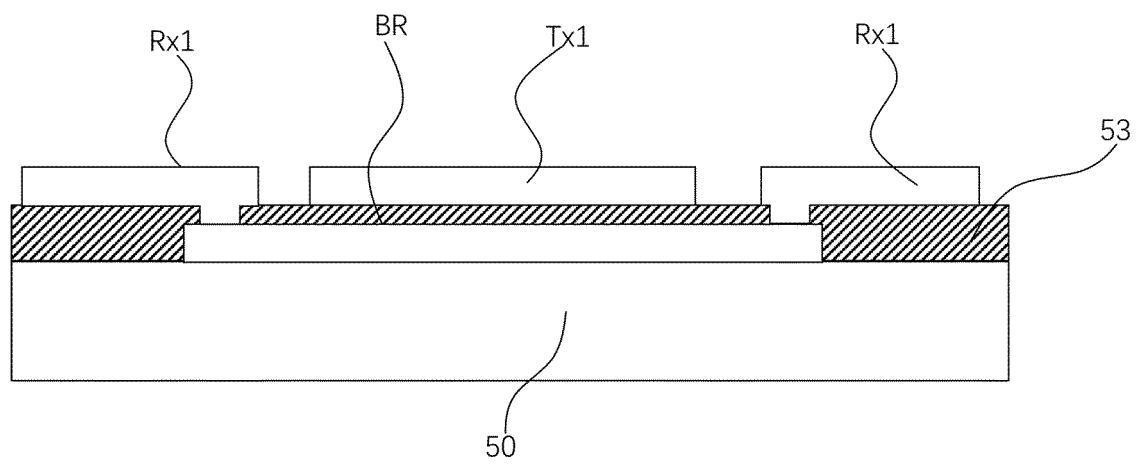


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

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5	A. CLASSIFICATION OF SUBJECT MATTER		
	G02B 5/30(2006.01)i; G02F 1/1335(2006.01)i; G02F 1/1333(2006.01)i; G06F 3/041(2006.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
	B. FIELDS SEARCHED		
10	Minimum documentation searched (classification system followed by classification symbols)		
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	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	CNABS; CNTXT; CNKI; VEN; USTXT; WOTXT; EPTXT: 偏振, 偏光, 触控, 电极, 三醋酸纤维素, 透明, 导电, 液晶, TAC, PVA, polariz+, touch, electrode, transparent, conductive layer, liquid crystal		
	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	PX	CN 113376728 A (BEIJING ZAICHENG TECHNOLOGY CO., LTD.) 10 September 2021 (2021-09-10) description, paragraphs [0021]-[0026], and figures 1-7	1-10
25	X	CN 103440068 A (NANJING CEC PANDA LCD TECHNOLOGY CO., LTD.) 11 December 2013 (2013-12-11) description, paragraphs [0021]-[0046], and figures 4-10	1-10
	X	CN 108646334 A (WUHAN CHINA STAR OPTOELECTRONICS SEMICONDUCTOR DISPLAY TECHNOLOGY CO., LTD.) 12 October 2018 (2018-10-12) description, paragraphs [0019]-[0041], and figures 1-10	1-10
30	A	CN 107367785 A (INTERFACE TECHNOLOGY (CHENGDU) CO., LTD. et al.) 21 November 2017 (2017-11-21) entire document	1-10
	A	CN 205451012 U (NAZHIYUAN TECHNOLOGY (TANGSHAN), LLC) 10 August 2016 (2016-08-10) entire document	1-10
35	A	WO 2015149264 A1 (HUAWEI DEVICE CO., LTD.) 08 October 2015 (2015-10-08) entire document	1-10
40	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
50	Date of the actual completion of the international search		Date of mailing of the international search report
	01 December 2021		13 January 2022
55	Name and mailing address of the ISA/CN		Authorized officer
	China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China		
	Facsimile No. (86-10)62019451		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/124273

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2014065000 A1 (KONICA MINOLTA, INC.) 01 May 2014 (2014-05-01) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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CN 103440068 A	11 December 2013	None	
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